UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
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MEMORANDUM FOR Distribution

From: Cynthia Clark
Associate Director for Methodology and Standards

Subject: Comparison of Dual System Estimation A and C

I am Pleased to present the executive summary of one of the evaluation studies for the Census 2000 Dress Rehearsal. The dress rehearsal was conducted in three sites — Columbia, South Carolina; Menominee County, Wisconsin; and Sacramento, California. The evaluation studies cover detailed aspects of eight broad areas related to the census dress rehearsal — census questionnaire, address list, coverage measurement, coverage improvement, promotion activities, procedures addressing multiple options for census reporting, field operations, and technology.

The executive summary for each evaluation study is also available on the Census Bureau Internet site (http://www.census.gov/census2000 and click on the link to "Evaluation"). Copies of the complete report may be obtained by contacting Carnelle Sligh at (301) 457-3525 or by e-mail at carnelle.e.sligh@ccmail.census.gov. Please note that the complete copy of the following reports will not be publically released: reports regarding procedures addressing multiple options for census reporting and the Evaluation of Housing Unit Coverage on the Master Address File.

The evaluations are distributed broadly to promote the open and thorough review of census processes and procedures. The primary purpose of the dress rehearsal is to simulate portions of the environment we anticipate for Census 2000, so we can identify and correct potential problems in the processes. Thus, the purpose of the evaluation studies is to provide analysis to support time critical review and possible refinements of Census 2000 operations and procedures.

The analysis and recommendations in the evaluation study reports are those of staff working on specific evaluations and, thus, do not represent the official position of the Census Bureau. They represent the results of an evaluation of a component of the census plan. They will be used to analyze and improve processes and procedures for Census 2000. The individual evaluation recommendations have not all yet been reviewed for incorporation in the official plan for Census 2000. These evaluation study reports will be used as input to the decision making process to refine the plans for Census 2000.

The Census Bureau will issue a report that synthesizes the recommendations from all the evaluation studies and provides the Census Bureau review of the dress rehearsal operation. This report will also indicate the Census Bureau's official position on the utilization of these results the Census in 2000 operation. This report will be available July 30th.

Comparison of Dual System Estimation A and C

July 1999

Eric Schindler
Decennial Statistical Studies Division

EXECUTIVE SUMMARY

People who move between Census Day and the date of the coverage survey interview make a substantial contribution to the total coverage errors in the dual system estimates for the decennial census. One part of this contribution arises because people about to move may not mail-back the census form for their Census Day address and may be gone before the nonresponse interviewers arrive. This may result in poor quality data in the census for the movers. This evaluation is concerned with the second part of the contribution which arises because of the difficulty of measuring the quality of the movers' census data. It is difficult to find and match the Census Day records and the coverage survey interview (either a Post Enumeration Survey as in 1990, or an Integrated Coverage Measurement survey as in the Census 2000 Dress Rehearsal, or an Accuracy and Coverage Evaluation survey as planned for Census 2000) records for movers.

This evaluation examines the alternative estimation treatments available for movers in the dual system estimation framework and compares two of them empirically.

This evaluation answers the following questions:

- **What are the estimation options available for movers in dual system estimation?**

  For the last twenty years, three approaches to the problem of dual system estimation for movers have been available. Dual system estimate A obtains coverage survey data, usually by proxy, for people who move out of the survey area after Census Day. Dual system estimate B matches people who move into the coverage survey area after Census Day back to their original addresses and census forms. Dual system estimation C is a hybrid which uses the demographic characteristics of the people who have moved into the coverage survey areas but the matching characteristics of the persons who have moved out. In general it is easier to do the matching for dual system estimate A but easier to get good demographic data for dual system estimate B. Dual system estimate C uses the best aspects of the other two methods. This paper compares the results from dual system estimate A and dual system estimate C using data for the Census 2000 Dress Rehearsal. Inmovers were not matched, so the data needed to evaluate dual system estimate B were not available.

- **Why was Dual System Estimate C was chosen for the Census 2000 Dress Rehearsal?**

  For the Census 2000 Dress Rehearsal it was decided that dual system estimate C would be most appropriate. Dual system estimate B was rejected for the Dress Rehearsal because the plans for nonresponse followup sampling would mean coding some inmovers back to units not in the nonresponse followup sample. Dual system estimate A was rejected because outmover tracing is difficult and would not result in a good estimate of the total number of outmovers. Dual system estimate C had the advantage of using the relatively good estimate of inmovers and then estimating residence and match probabilities (not from their hard to find or nonexistent census forms but) from those outmovers who could be collected by proxy, as in the Dress Rehearsal, or by outmover tracing, as in the evaluation sample. The Outmover Tracing Evaluation for the Census 2000 Dress Rehearsal showed that there is little gain in an outmover tracing operation as it can be implemented.

- **Is the use of the hybrid dual system estimate C appropriate?**

  With only a few exceptions for births, deaths, and international migration, every mover is both an inmover and an outmover. The actual numbers of inmovers and outmovers should roughly match. However, because outmovers are collected by proxy and inmovers are usually collected from a household member, the inmovers are more likely to be collected accurately. For example, apartment managers are likely to know only about the adults on the lease who have moved out but not about their children or adults not on the lease. Over poststrata encompassing large geographic areas and over a relatively short time frame, the estimated number of inmovers is likely to be closer to the actual number of outmovers than the estimated number of outmovers. The outmover match rates which will be applied to this best available estimate of the actual number of outmovers have been shown in the outmover tracing evaluation to be as well estimated using proxy data from the outmovers as using data obtained by tracing outmovers to their new addresses. Thus, in the context of Census 2000, dual system estimate C is considered to be the operationally superior of these two options.

- **How do the site levels estimates compare for Dual System Estimates A and C?**

  The site level results shown in Table A show that the differences were small in all three Census 2000 Dress Rehearsal sites, and that they were statistically significant only in the Sacramento, CA site, where the difference, 823 persons, was about 2.4 times the standard error (344). As was expected, the estimates for dual system estimate A were smaller than those for dual system estimate C.

Table A: Summary Statistics for Household Population
(se in Parentheses)

	Columbia	Menominee	Sacramento
Census Count	628,616	4,550	369,434
Dual System Estimate C	693,724 (11,976)	4,694 (103)	395,005 (4,646)
Dual System Estimate A	693,524 (11,995)	4,647 (88)	394,183 (4,562)
Difference	199 (260)	47 (54)	823 (344)

- **How do the estimates compare for race groups?**

  In Sacramento there were four race/origin groups after collapsing: Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asians, and all others, mostly Hispanics. In Menominee there were three groups: Non-Hispanic Whites, Hispanics, and all others, mostly American Indians. In Columbia, there were two groups: Non-Hispanic Whites and all others, mostly Non-Hispanic Blacks. Table B shows that the use of dual system estimate A or dual system estimate C made little difference for most of these groups. Although we haven't done any statistical testing for any of these differences, it is possible that differences could be differential by race group.

Table B: Differences by Race/Origin Group

	Race/Origin Group	Census	Dual System Estimate C	Dual System Estimate A	Difference	Percent Difference
Columbia	N-H White N-H Black +	359,854 268,762	384,073 309,651	383,956 309,568	117 83	0.03% 0.03%
Menominee	N-H White N-H AI + Hispanic	576 3,859 115	520 4,024 150	495 4,034 119	25 -10 31	5.05% -0.25% 26.05%
Sacramento	N-H White N-H Black N-H Asian Hispanic +	160,620 59,005 58,890 90,919	168,555 64,647 62,643 99,161	168,460 64,264 62,501 98,958	95 383 142 203	0.06% 0.60% 0.23% 0.21%
The + indicates that smaller race/origin groups are combined with this group.						

- **What was learned from estimates at the poststratum level?**

  The poststratum level estimates indicated that the differences between dual system estimate A and dual system estimate C were statistically significant only in Sacramento. Examining the race/origin groups individually, statistical significance was observed only for the owner and Hispanic Origin populations in Sacramento.

The answers to these questions provided the information needed to determine that the decision to use DSE C in the Census 2000 Dress Rehearsal should remain in effect for Census 2000.